APPLICATION NOTE

AP-247

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Adding Capability to the NDS-II System with Cluster Boards

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INTRODUCTION

The ISIS cluster board (iMDX 581) was introduced into the NDS-II product line to reduce dramatically the cost of a personal workstation. It achieved this goal and gave the network numerous expansion opportunities. All of the applications discussed in this note are available through the NDS-II toolbox.

ADDING ADDITIONAL USERS

The cluster board is a single MultibusR board with an 8085-2 processor, 64 K of RAM, an RS232 serial port, and other supporting circuitry. Figure 1 shows a block diagram, and a complete circuit diagram is included in Appendix A. A cluster board may be installed into any master slot of a network Model 800 or Series II, III, or IV development system to support an additional network user via a dumb terminal. This low-cost method of adding extra users to the network served as the primary motivator for the development of the cluster board.

With the exception of Multibus slot, some power, and access to the host's Ethernet controller board, the cluster board uses none of its host development system's resources. The cluster board does not slow the host, which generally has no knowledge of its presence in the system. A host may support multiple cluster boards. Figure 2 shows the maximum number that may be added to each host system.

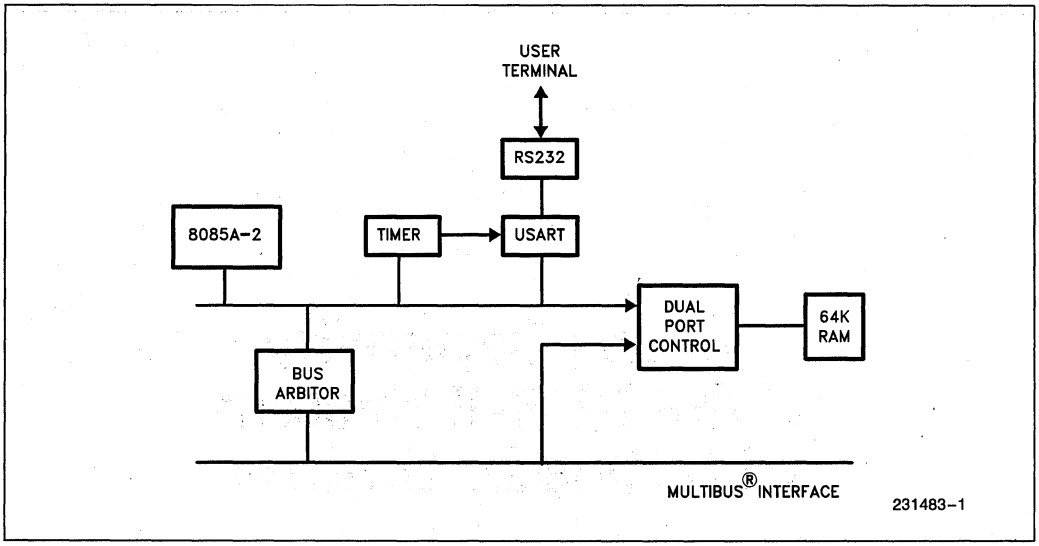


Figure 1. Cluster Board Block Diagram

During initialization of the host system, an operating system is loaded from the network resource manager (NRM) into the RAM of the cluster board. While ISIS operating system was chosen to ensure compatability with previous development environments, CP/M-80 may also be used (see AP 253). During operation, ISIS accesses data files and programs from the protected hierarchical file system of the NRM using the Ethernet controller boards. Access to local host devices, such as floppy disks or Winchester disks, is not permitted.

In normal use, a dumb CRT would be connected to the RS232 port of the cluster board. The user would then have access to all of the 8-bit network tools, including full-screen editors, program management tools, and electronic mail. While some 8-bit compilers are also available, the cluster board is generally used for interactive work supportng the engineer (or the support staff). Access to 16-bit advanced tools is available via the Export facility of the networks' distributed job-control system, where the cluster user may generate a job using

local tools and then request its execution on a more capable system upon the same network. This productive shared-tool environment is described further in AP 244.

It is not mandatory to install a dumb CRT. In fact, any RS232 device will suffice. The possibilities are endless, since RS232 is one of the few standards in the electronics industry today. Although this article will discuss various applications, the solution is general in nature, and anysystem with an RS232 interface could be connected to the cluster board.

REMOTE NETWORK OPERATION

Figure 3 shows the connection of an Intel iPDSTM portable development system. The iPDS system is especially suited to 8-bit microprocessor applications development. It has many tools for individual development but does not include advanced network tools, such as electronic mail or program management. In this application, the iPDS system is at a remote site, and a modem link connects the iPDS system to the NDS-II network.

A dumb terminal emulator program called REMOTE has been written for the iPDS system. This program, as part of the network toolbox, includes autodialing a Hayes smart modem. While running in terminal emulation mode, the iPDS can access all facilities of the network, including electronic mail and distributed job control facilities. REMOTE also includes a file-transfer protocol that enables data transfer between the iPDS system and the NRM.

If the iPDS system is at a service location, you need a diagnostic program from the NRM. Or, the iPDS could have data gathered from a remote site to be analysed back at base. The possibilities are endless.

System	Maximum Clusters
Model 800	2
Series II	3
Series III	1
Series IV	3
Expansion Chassis	4

Figure 2. Adding Cluster Boards to Host Systems

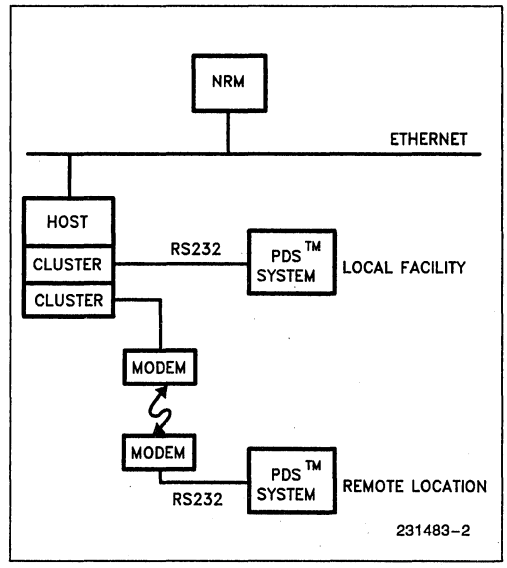


Figure 3. Attaching the iPDS™ System to the Network via an ISIS Cluster Board

ADDING AN ADDITIONAL PRINTER

An additional printer is often required on an NDS-II system. Letter quality printers are popular and their RS232 connection makes them a natural for connection to the cluster board. One problem - how does an output device such as a printer LOGON to the network and initiate file transfer from file to paper.

Server is a slight modification of the standard cluster PROM - it includes a PROM based console to solve the initialization problem. After power-up the LOGON program calls the console input routine to input the user name and password - within server a user name and password is supplied from PROM (Refer to the AP-242 — Additional printer support for the NDS II — for more complete information.)

Once logged on the system executes an initialization file ISIS.INI from the users home directory. In this server example a program that never exits will be chosen - PRINCE, a versatile serial printer driver, is such a program. Following initial drive assignments PRINCE polls a directory looking for files, once a file is identified it is copied to the serial printer and then deleted - simple but most effective.

AUTOBOOT CLUSTER BOARD

BOOTUP is an extensively modified cluster PROM. Rather than rely upon a host system to provide its operating system BOOTUP allows a cluster board to load its own ISIS operating system from the network. Following power-up BOOTUP initializes an SBC550 Ethernet controller and then logs on to the NRM under a predefined name of ISIS. Once logged on BOOTUP loads its operating system from the network. Before passing control to the user BOOTUP seeks out and initializes any other cluster boards also installed within the same chassis.

BOOTUP provides the network user with a low cost method of adding software developers - take any iSBC chassis, add an Ethernet Comm set and a cluster board containing the BOOTUP PROM and the system is complete. Up to seven additional cluster boards may be added to provide a very low cost eight-user environment as shown in Figure 4. BOOTUP also supports the server concept. The BOOTUP PROM is provided with the Network/Series IV Toolbox product.

CONCLUSION

I hope I have explained some of the versatility of the ISIS cluster board. Think of it as a universal interface board between the complex multi-protocol world of Ethernet and the straight forward start-data-stop world of RS232. I am sure this will prompt many new applications for the product - feel free to experiment and benefit from your findings.

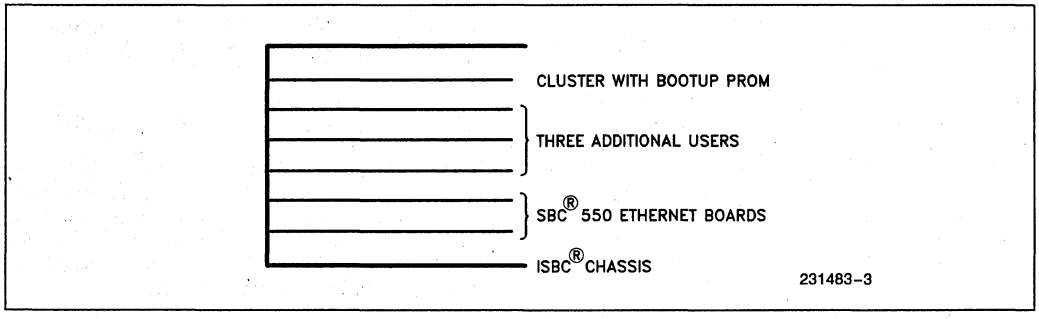
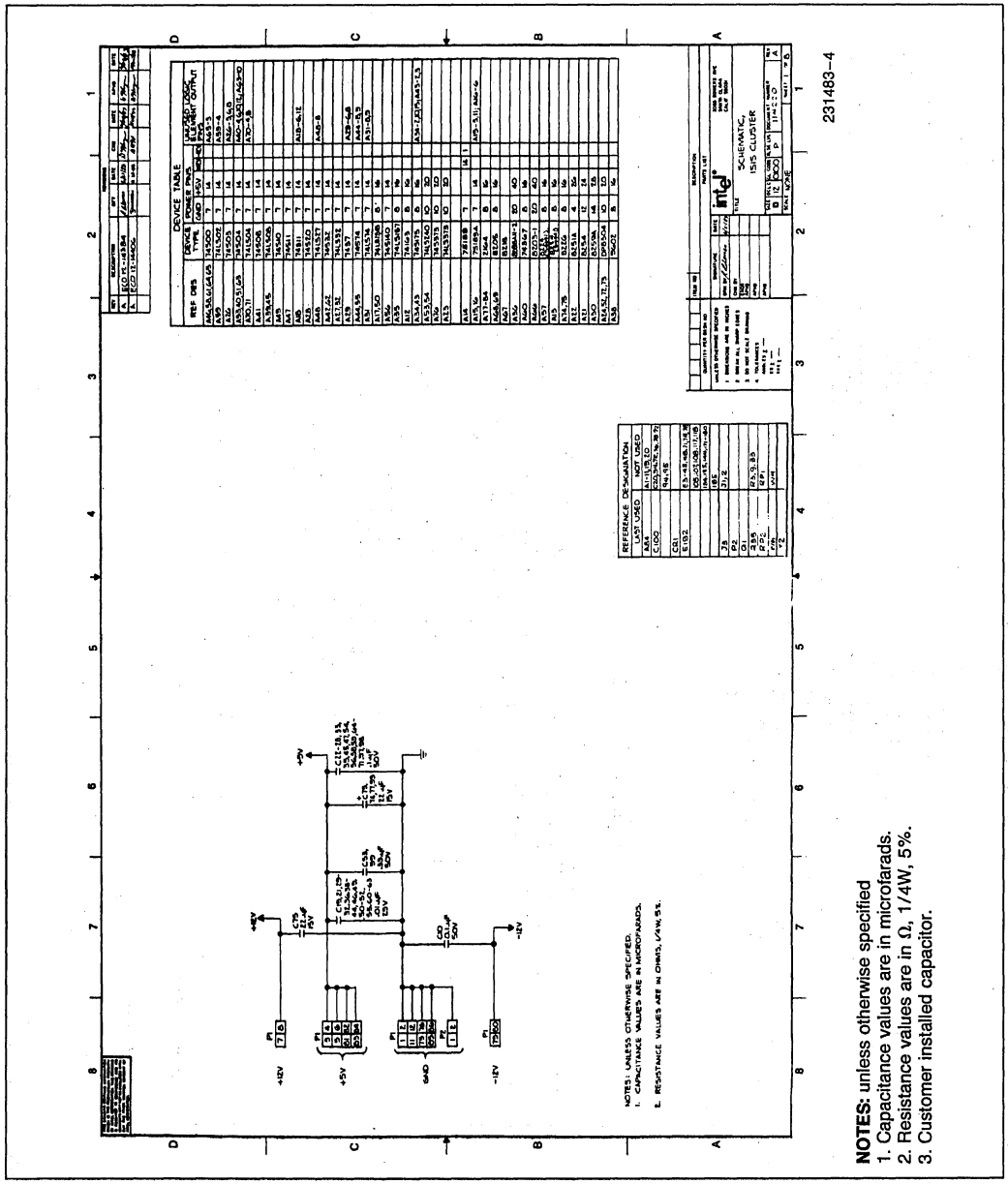


Figure 4. BOOTUP Allows a Low Cost iSBC® Chassis to Act as a Host for Software Developers

APPENDIX A
CLUSTER BOARD ADDS CAPABILITY



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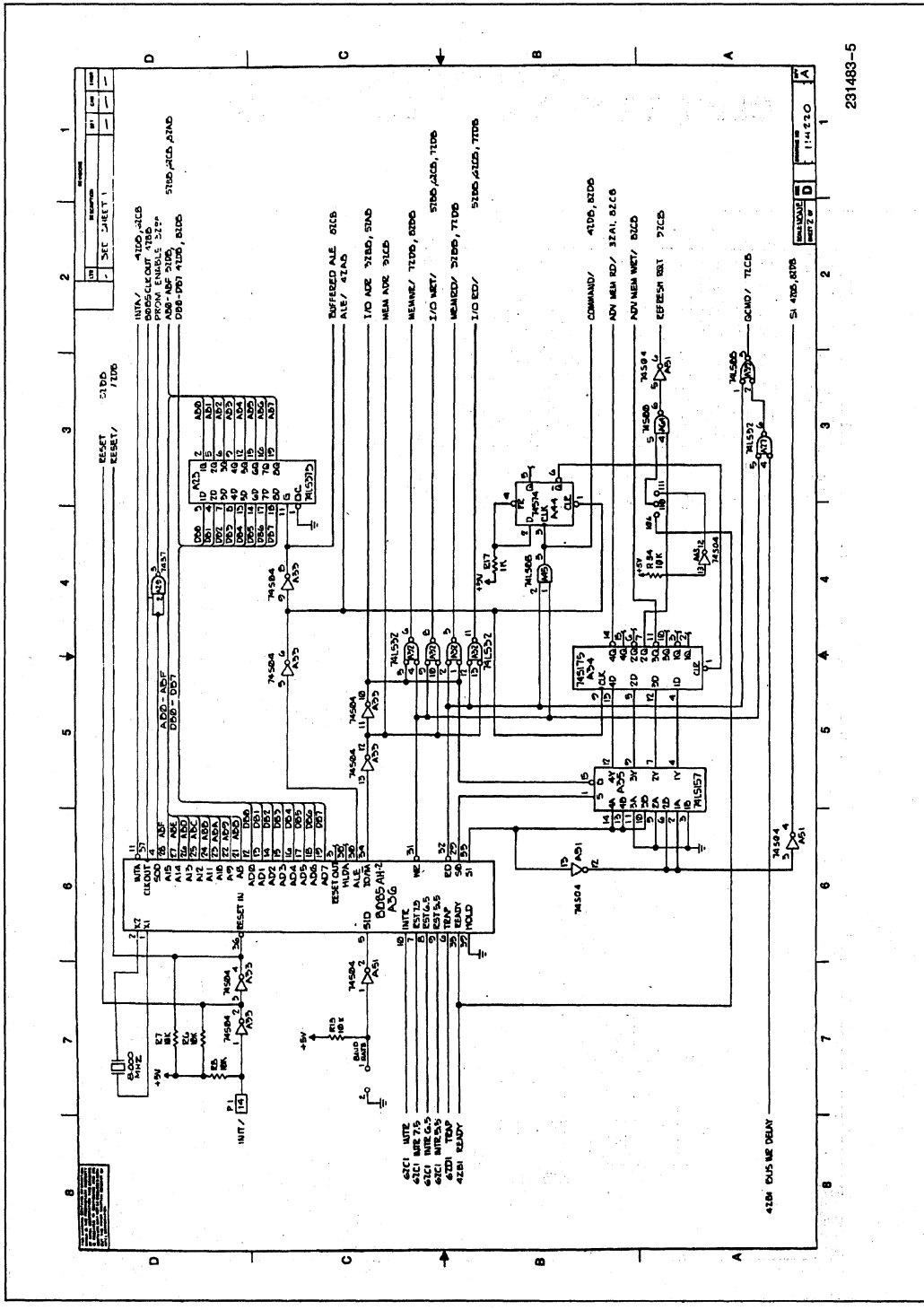
NOTES: unless otherwise specified
1. Capacitance values are in microfarads.
2. Resistance values are in Ω, 1/4W, 5%.
3. Customer installed capacitor.



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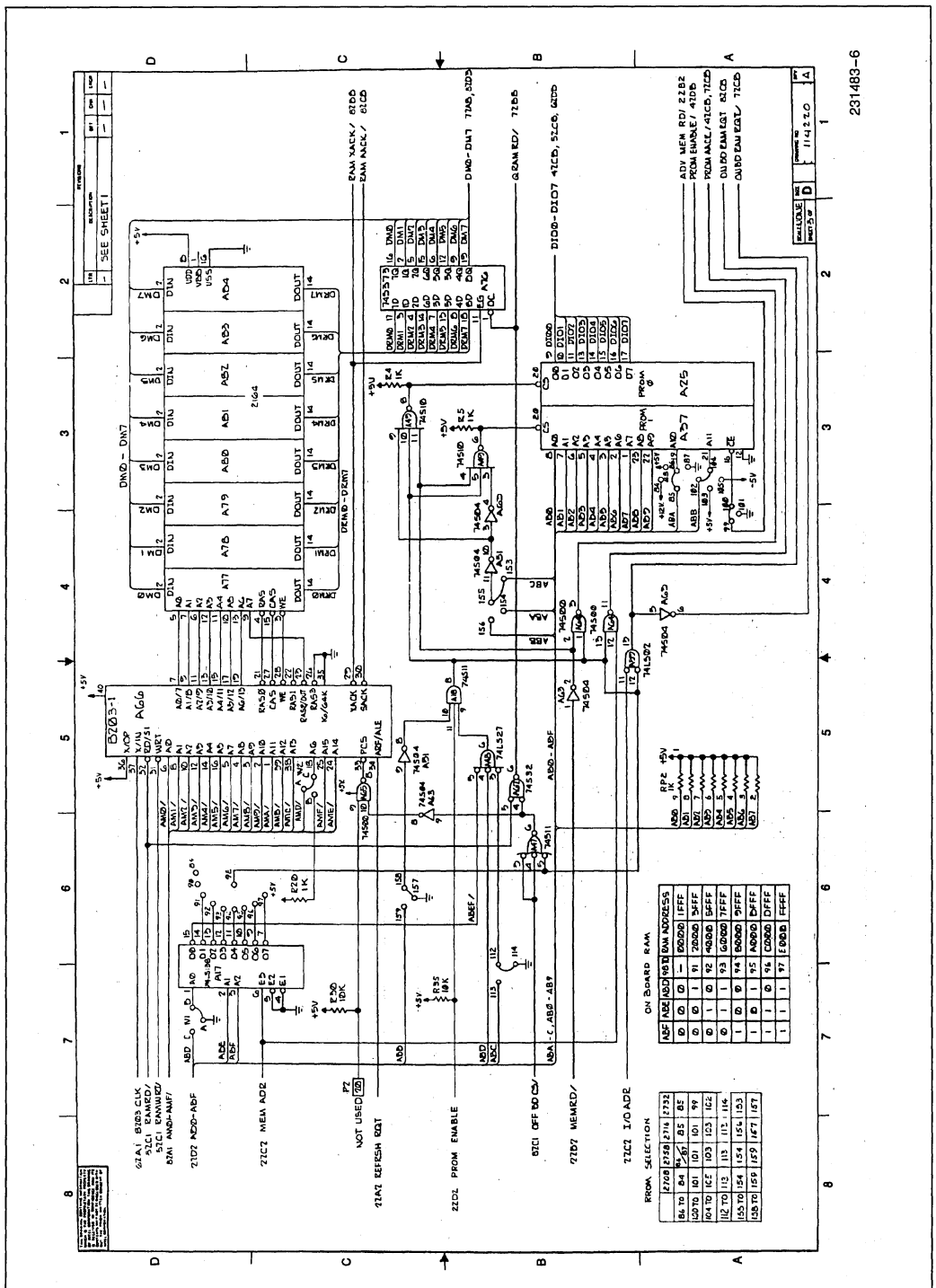
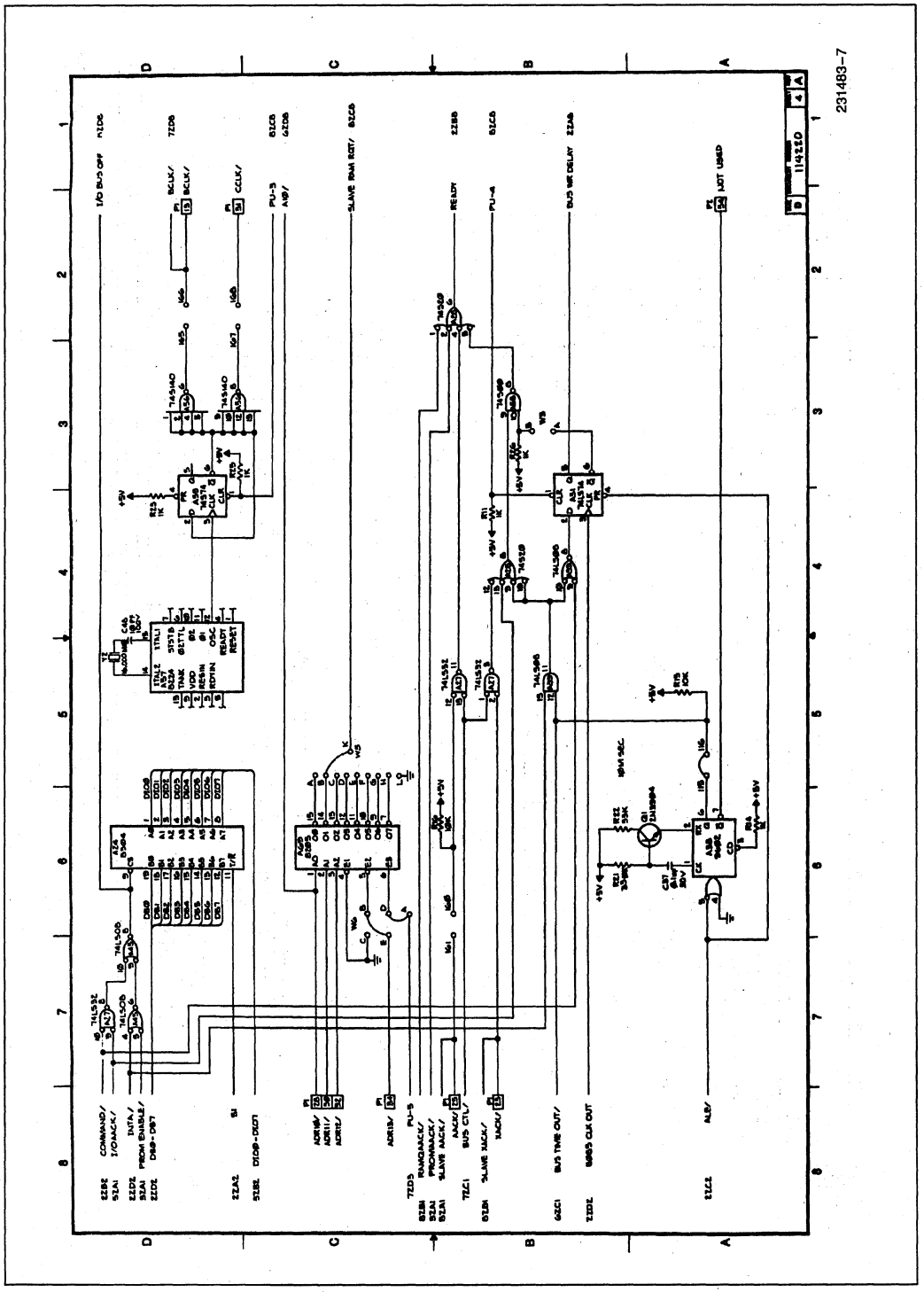

SEE SHEET1
231483-6



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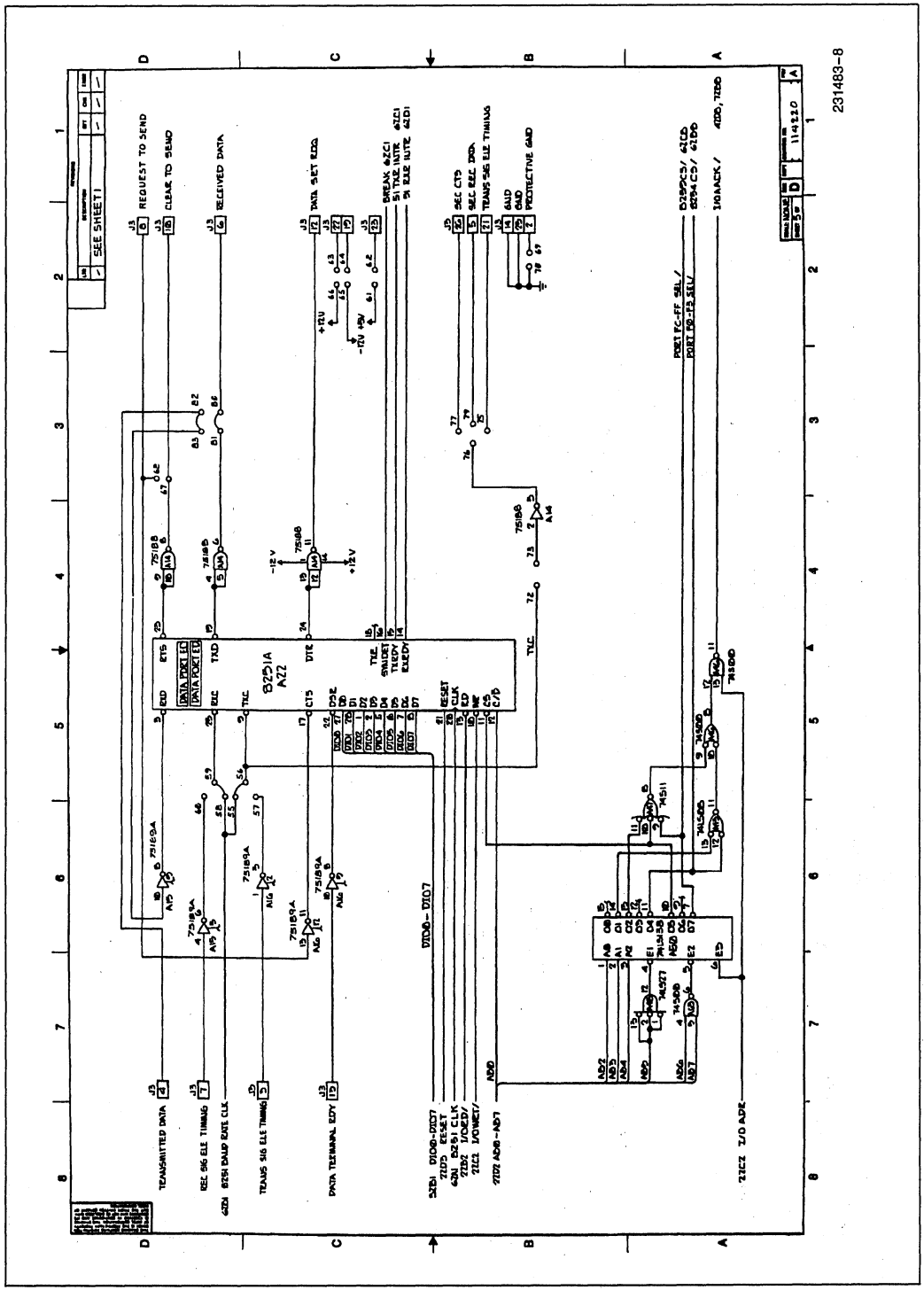
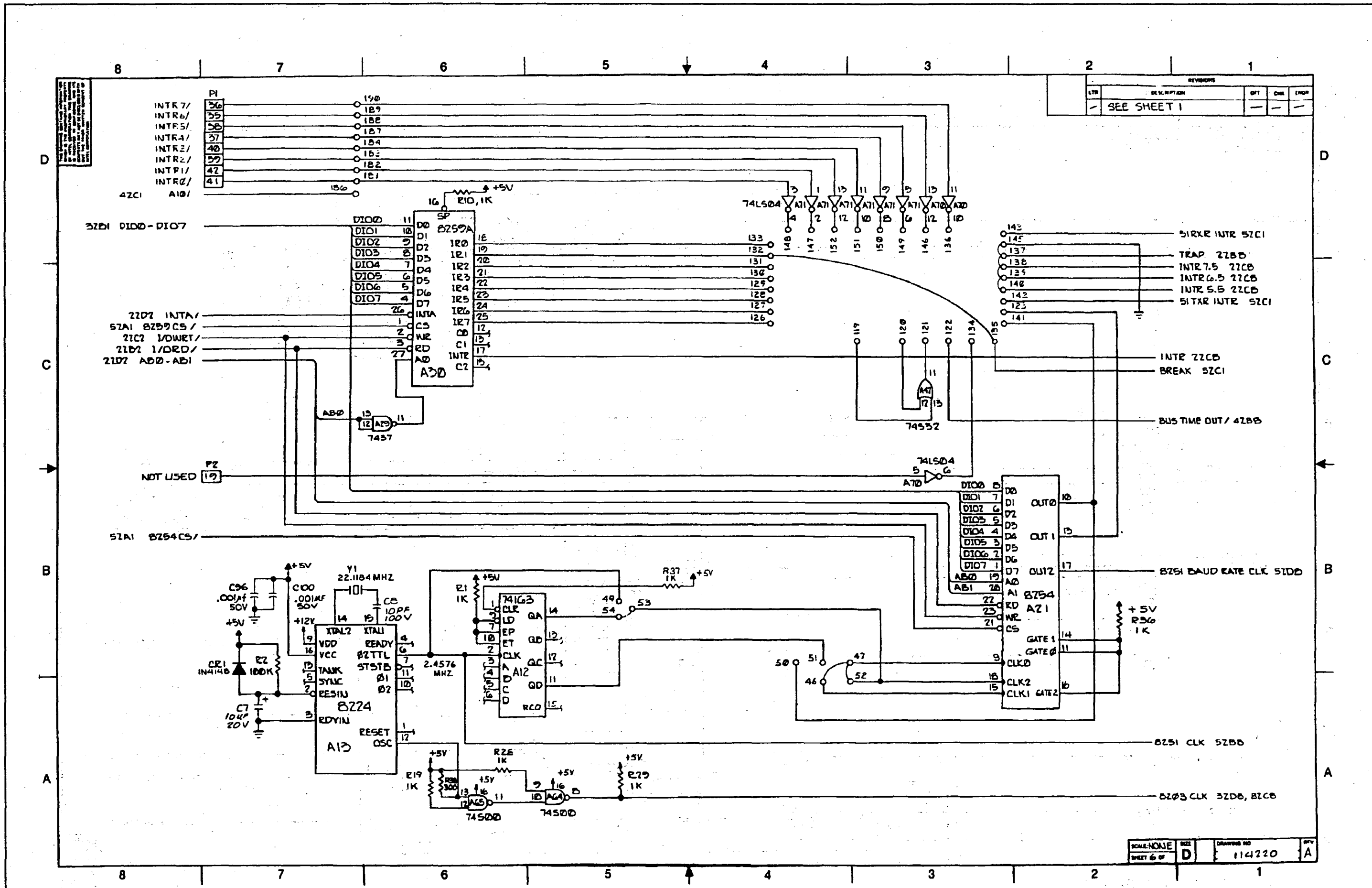

SEE SHEET1
REQUEST TO SEND
CLEAR TO SEND
RECEIVED DATA
TRANSMITTED DATA
DATA SET RDY
SEC CTS
SEC REC DATA
TRANS SIG ELE TIMING
GND
PROTECTIVE GND
REC SIG ELE TIMING
BRG BAUD RATE CLK
TRANS SIG ELE TIMING
DATA TERMINAL RDY
8251A
A22
DTE
DCE
TXD
RXD
RTS
CTS
TXC
RXC
DSR
DTR
RESET
CLK
RD
WR
C/D
D0
D1
D2
D3
D4
D5
D6
D7
+12V
-12V
+5V
75188
75189A
74LS00
74LS04
74LS11
74LS08
74LS27
74LS38
74LS86
74LS20
231483-8



INTR7/
INTR6/
INTR5/
INTR4/
INTR3/
INTR2/
INTR1/
INTR0/
A10/
3ZB1 DID0-DIO7
8259A
A30
74LS04
2ZD2 INTA/
52A1 8259CS/
2ZC2 I/OWRT/
2ZB2 I/ORD/
2ZD2 AB0-AB1
7437
74S32
NOT USED
8254
A21
51RXR INTR 52C1
TRAP 22B8
INTR7.5 22C8
INTR6.5 22C8
INTR5.5 22C8
51TXR INTR 52C1
INTR 22C8
BREAK 52C1
BUS TIME OUT/ 42B8
52A1 8254CS/
8251 BAUD RATE CLK 51D8
Y1
22.1184 MHZ
8224
A13
2.4576 MHZ
74163
A12
8251 CLK 52B8
8203 CLK 32D8, 81C8
74S00
SEE SHEET 1
SCALE NONE
SHEET 6 OF
D
114220
A

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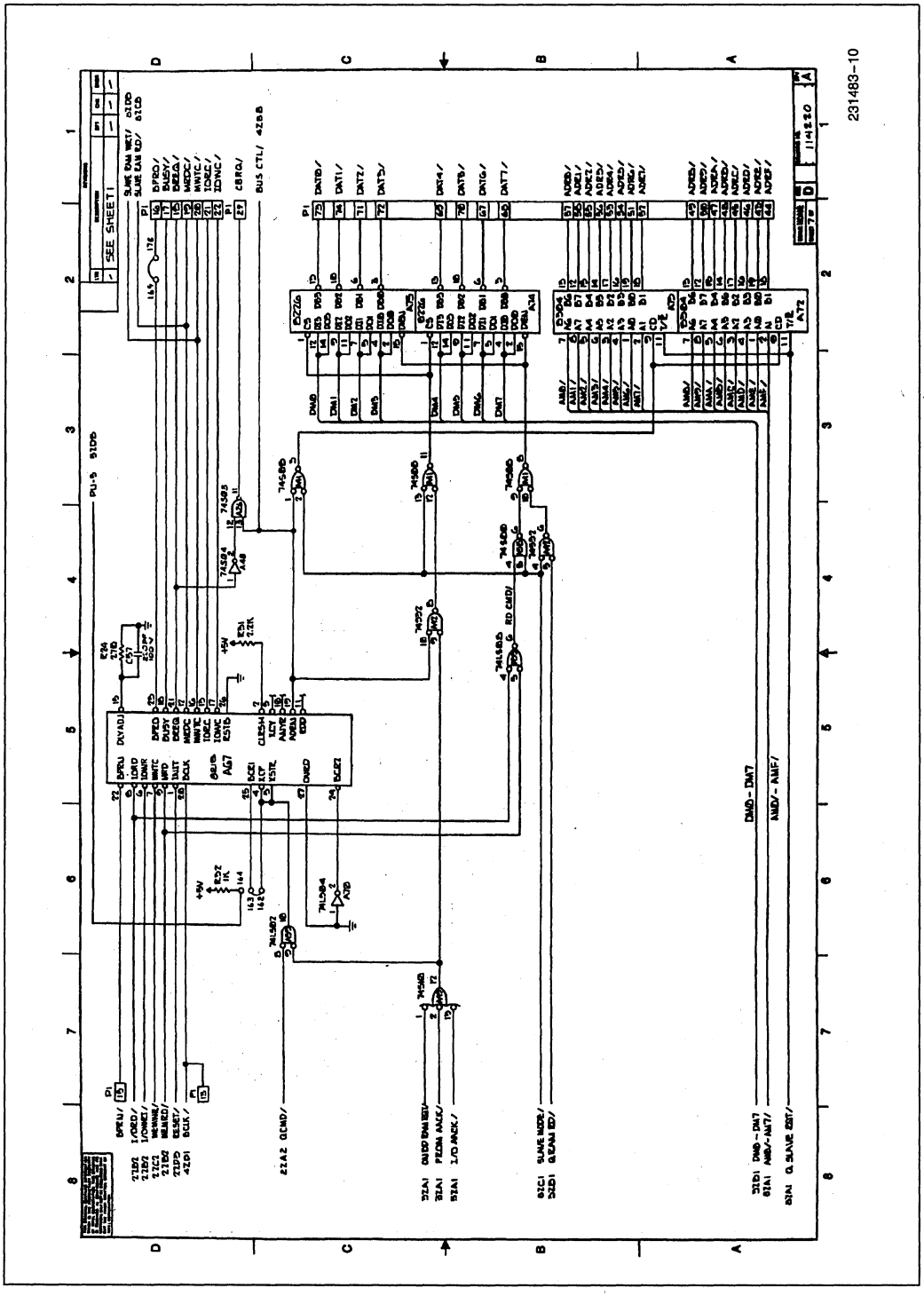

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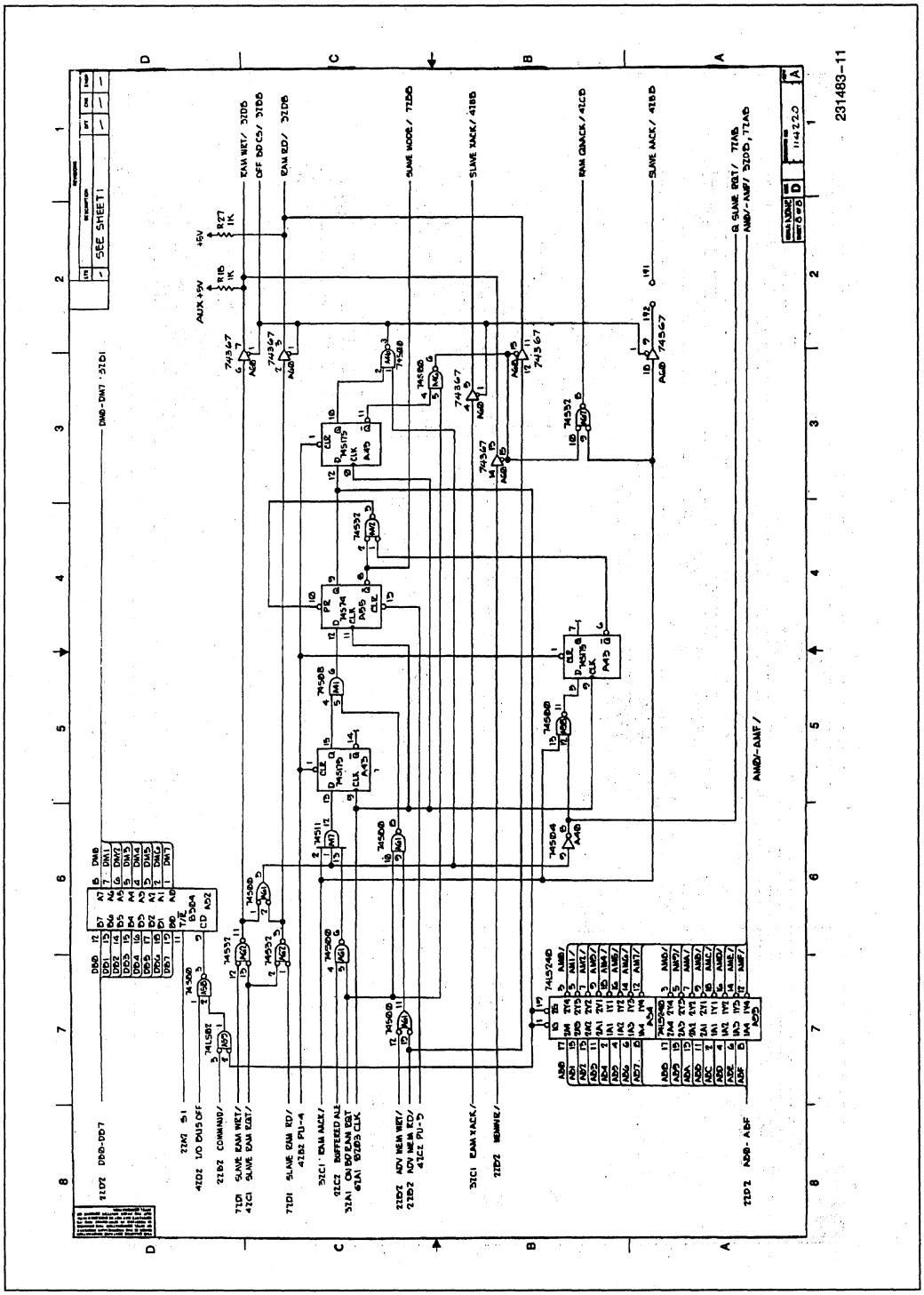
SEE SHEET 1
231483-11